

PROBLEM: Sam's Sub Shoppe uses cheese and ham to make large and small subs. A large sub uses 4 oz. of cheese and 5 oz. of ham. A small sub uses 2 oz. of cheese and 3 oz. of ham. Sam has 24 pounds (384 oz.) of cheese and 32 pounds (512 oz.) of ham. How many large and small subs should he make to use all the ham and cheese?

ERASE



1



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ERASE



2



Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

Lecture 23

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ERASE



3



Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

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ERASE



4



Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

4
 (oz./large sub)

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ERASE



5



Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$4x$
 (oz./large sub)(# of large subs)

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ERASE



6



Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$4x = \#$ oz. cheese used to make large subs
 (oz./large sub)(# of large subs)

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ERASE



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Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$4x$ $2y$
 (oz./large sub)(# of large subs) (oz./small sub)(# of small subs)

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Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$4x$ $2y$
 (oz./large sub)(# of large subs) (oz./small sub)(# of small subs)

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Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$$(oz./large\ sub)(\# \text{ of large subs}) + (oz./small\ sub)(\# \text{ of small subs})$$

$$4x + 2y$$

ERASE



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Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$$4x + 2y \quad (\text{ounces})$$

ERASE



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Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$$4x + 2y = 384$$

ERASE



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Let,
 $x = \#$ of large subs made
 $y = \#$ of small subs made

How much cheese is used?

$$4x + 2y = 384$$

How much ham is used?

$$5x + 3y = 512$$

ERASE



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$$4x + 2y = 384$$

$$5x + 3y = 512$$

ERASE



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$$4x + 2y = 384$$

$$5x + 3y = 512$$

ERASE



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$$\begin{array}{l} 4x + 2y = 384 \\ 5x + 3y = 512 \end{array} \longrightarrow \begin{bmatrix} 4 & 2 & 384 \\ 5 & 3 & 512 \end{bmatrix}$$

ERASE



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$$\begin{array}{l} 4x + 2y = 384 \\ 5x + 3y = 512 \end{array} \longrightarrow \begin{bmatrix} 4 & 2 & 384 \\ 5 & 3 & 512 \end{bmatrix} \quad \text{NEXT} \rightarrow 5R_1$$

ERASE



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 20 & 10 & 1920 \\ 5 & 3 & 512 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

NEXT

ERASE



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 20 & 10 & 1920 \\ 20 & 12 & 2048 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

NEXT $-1R_1 + R_2$

ERASE



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 20 & 10 & 1920 \\ 0 & 2 & 128 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

NEXT $-1R_1 + R_2$
 $-5R_2 + R_1$

ERASE



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 20 & 0 & 1280 \\ 0 & 2 & 128 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

NEXT $(1/20)R_1$
 $-1R_1 + R_2$
 $-5R_2 + R_1$

ERASE



20



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 1 & 0 & 64 \\ 0 & 2 & 128 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

NEXT $(1/20)R_1$
 $(1/2)R_2$

ERASE



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 1 & 0 & 64 \\ 0 & 1 & 64 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

NEXT $(1/20)R_1$
 $(1/2)R_2$

ERASE



22



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$$\begin{aligned} 4x + 2y = 384 &\longrightarrow \begin{bmatrix} 1 & 0 & 64 \\ 0 & 1 & 64 \end{bmatrix} & \begin{array}{l} 5R_1 \\ 4R_2 \end{array} \\ 5x + 3y = 512 & \end{aligned}$$

Make 64 large subs and 64 small subs.

NEXT $(1/20)R_1$
 $(1/2)R_2$

ERASE



23



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